

The following presentation was made by Todd Kratzer at the October 3, 2012 NJ Water Monitoring Council Meeting, just several days prior to his sudden, tragic passing.

The Council wishes to acknowledge his active participation, willingness to share his monitoring expertise, and dedication to preserving, protecting and restoring the quality of NJ's waters.

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# Lockatong and Wickecheoke Creek Watersheds Stormwater-Control Program



**\*Automated Stormwater Monitoring and Sampling\***

**New Jersey Water Supply Authority  
Todd Kratzer, Project Manager**

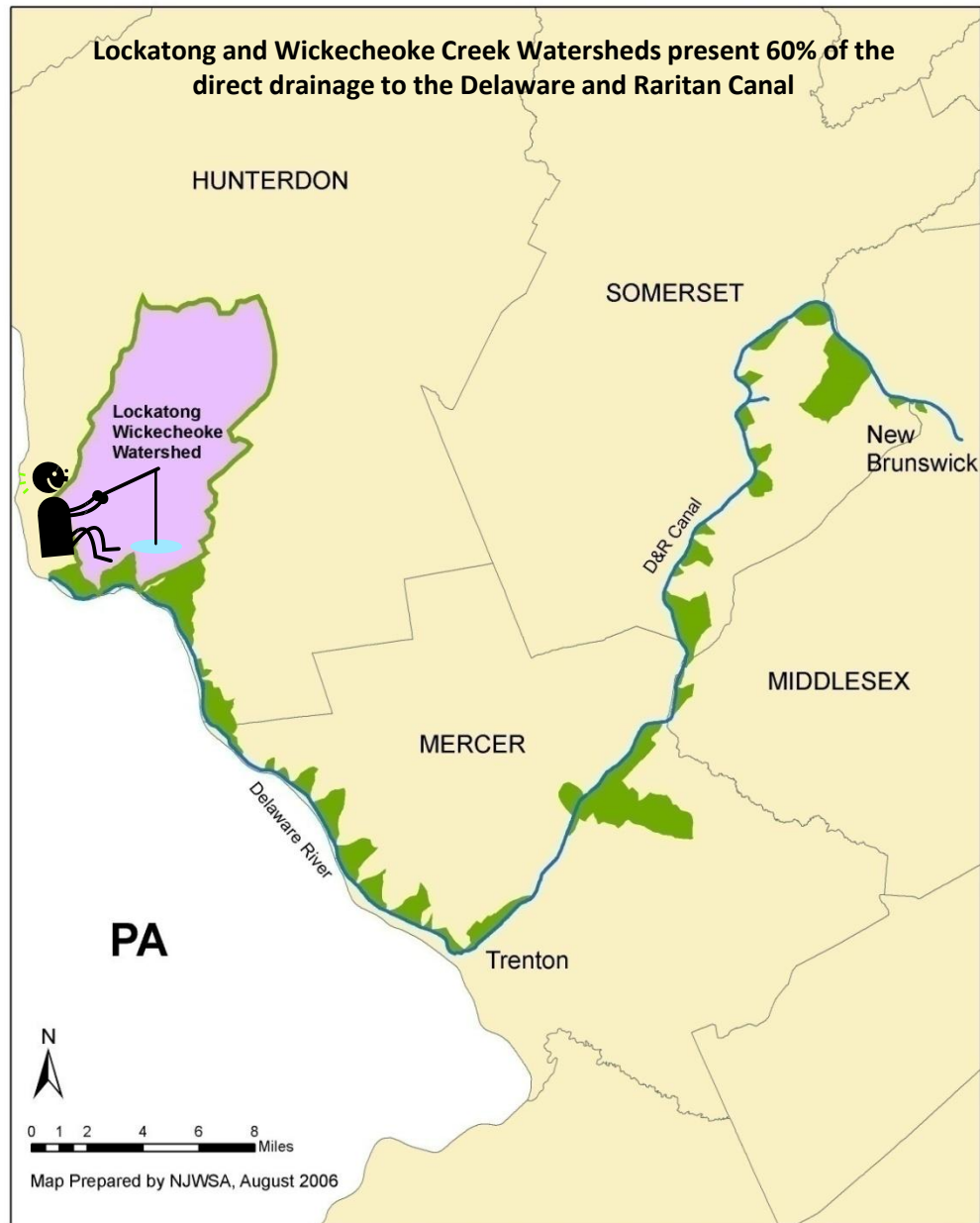


## Background

- The Watershed Protection Programs Division of the NJ Water Supply Authority was awarded a 319(h) grant by the NJDEP to implement innovative stormwater control projects at selected sites within the Lockatong and Wickecheoke Creek Watersheds, Hunterdon County, NJ
- Funded projects were recommended in the “Lockatong and Wickecheoke Creek Watersheds Restoration and Protection Plan”
- Techniques to reduce storm runoff volume and pollutant loadings from roadside-drainage and a public recreation area are being developed and will be implemented as State demonstration projects in partner municipalities: Kingwood, Raritan, Franklin, and Delaware Townships
- To determine the effectiveness of stormwater controls, assessments of runoff volume and quality are being conducted prior to, and following installation of the controls using automated storm-runoff samplers and precipitation monitors

## Direct Drainage to the Delaware & Raritan Canal

(Downstream of the Delaware River Intake)





# **Sediment Loadings**

**Data Source: Lockatong and Wickecheoke Creek Watershed Sediment and Phosphorus Source Report by the US Dept of Agriculture Natural Resources Conservation Service (2007):**

- **Up to 18,500 tons/year of storm-induced sediment loads are discharging into the D&R Canal from agriculture, forest, roads, and stream bank erosion**
  - **Approx. 3, 700 tons/year of storm-induced sediment loads are conveyed to the stream channels from road surfaces and the associated drainage systems**
  - **Approx. 12, 400 tons/year of sediment is contributed from stream-channel destabilization and erosion caused by the combination of increased runoff flows and the upland sediment loads**

**Sediment is a major vehicle for conveying nutrients and other contaminants to the streams and produces stream-bank erosion due to channel filling**

**Increasing substrate loadings to the D&R Canal increases annual maintenance and treatment costs for potable water supplies, degrades the aquatic ecosystem, and suppresses recreational opportunities for fishing, boating, and swimming**





**Targeted sediment sources in the watersheds**







**Effects to stream channel  
from storm-conveyed sediment and stream bank erosion**







**Increased sediment loads degrade the stream, and increase operation and treatment costs for potable water supplies**

**Delaware and Raritan Canal  
sediment removed by dredging**





# Stormwater Monitoring Sites



Raritan Township RT-1



Kingwood Park KP-2



Kingwood Park KP-2A



Delaware Township DT-1



Kingwood Park KP-1



# **Problem Assessment: Stormwater Sampling**

- Sampling during intense storm conditions?
- Sampling during the night?
- Sampling on weekends or holidays or during vacation?



# Solution: Automated Sampling

Automated samplers were installed and operated by Authority staff for the collection of storm flow data and water samples during rain events at 5 project sites

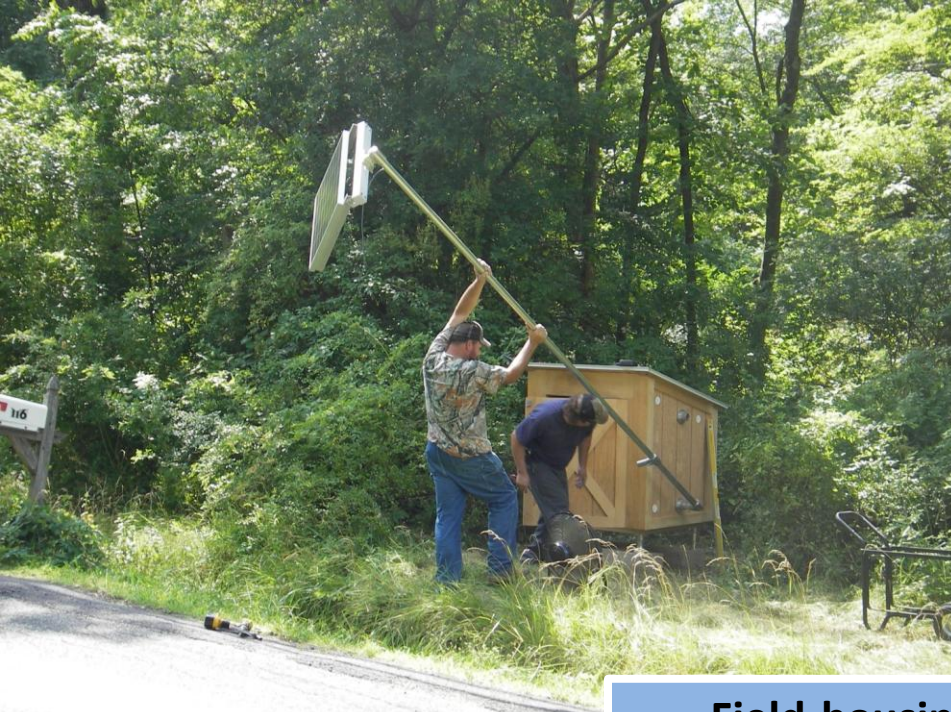
- Each sampler was programmed to collect either grab or composite samples at selected flow depth, time/date, precipitation, and/or water quality activation targets during a runoff event
- Samples were collected to represent water quality snapshots along the entire hydrograph
- Each sampler provided refrigeration for sample preservation prior to laboratory analyses
- In-situ samplers eliminated the often untimely instantaneous process of organizing staff, traveling to each site, and collecting samples during intense storms
- It is now possible to sample storm events occurring on a weekend or at night, and in remote locations



# **Sampler Installation/Operation**

All components of the sampling, including installation, operations, and data interpretation, were performed by NJWSA staff





Field-housing installation





# Stormwater Sample Collection

- Samplers were housed in the field in constructed shelters
- Each sampler was powered by two 12- volt batteries that were recharged daily by a 50 watt solar panel
- Sampler activation was triggered by selected water flow depths, calibrated for each sampling site
- Water depths were measured and recorded by the sampler at 2-minute intervals
- Water depths were associated with flow at 0.01 foot intervals
- Intake tubing was automatically purged and flushed for quality-control prior to each sample collection
- Up to 14 individual grab samples were collected for a storm event, pending water-depth triggering levels
- Samples were automatically cooled to less than 4° C after the first sample of the event was collected
- Sampling quality control was guided by a Quality Assurance Project Plan approved by the NJDEP





**Sample intake**

**Automated sampling system**



**Collected samples**

# Precipitation/Temperature Monitors





# Storm Data

- Data were collected throughout the storm hydrograph for flow and water quality concentrations to obtain existing water quality loadings for specific parameters (i.e., nutrients and solids)
- Water quality analyses: TP, NO<sub>2</sub>, NO<sub>3</sub>, NH<sub>3</sub>, TKN, Cl, TSS, and Turbidity – 2 composite samples per event
  - Samples were collected at predetermined water levels and were composited into 2 samples to represent the leading edge and the trailing end of the hydrograph
- Rain data were collected from 3 existing continuous recorders and 2 supplemental monitors installed by the Authority

# Data Interpretation/Uses

- Total runoff volume and loadings for nutrients and solids were calculated for each storm event
- The data are being used to provide actual site information to calibrate computer models, to accurately design stormwater controls and quantify their effectiveness, and to forecast runoff conditions associated with future changes in land use(s)
  - Ongoing effort...
- Precipitation data are being compared to the measured storm volumes for each event to determine the percentages of runoff and infiltration
  - Localized groundwater recharge estimates



# **Preliminary Findings**

The following draft results are based  
on data availability and analyses to  
date

# Limited Infiltration

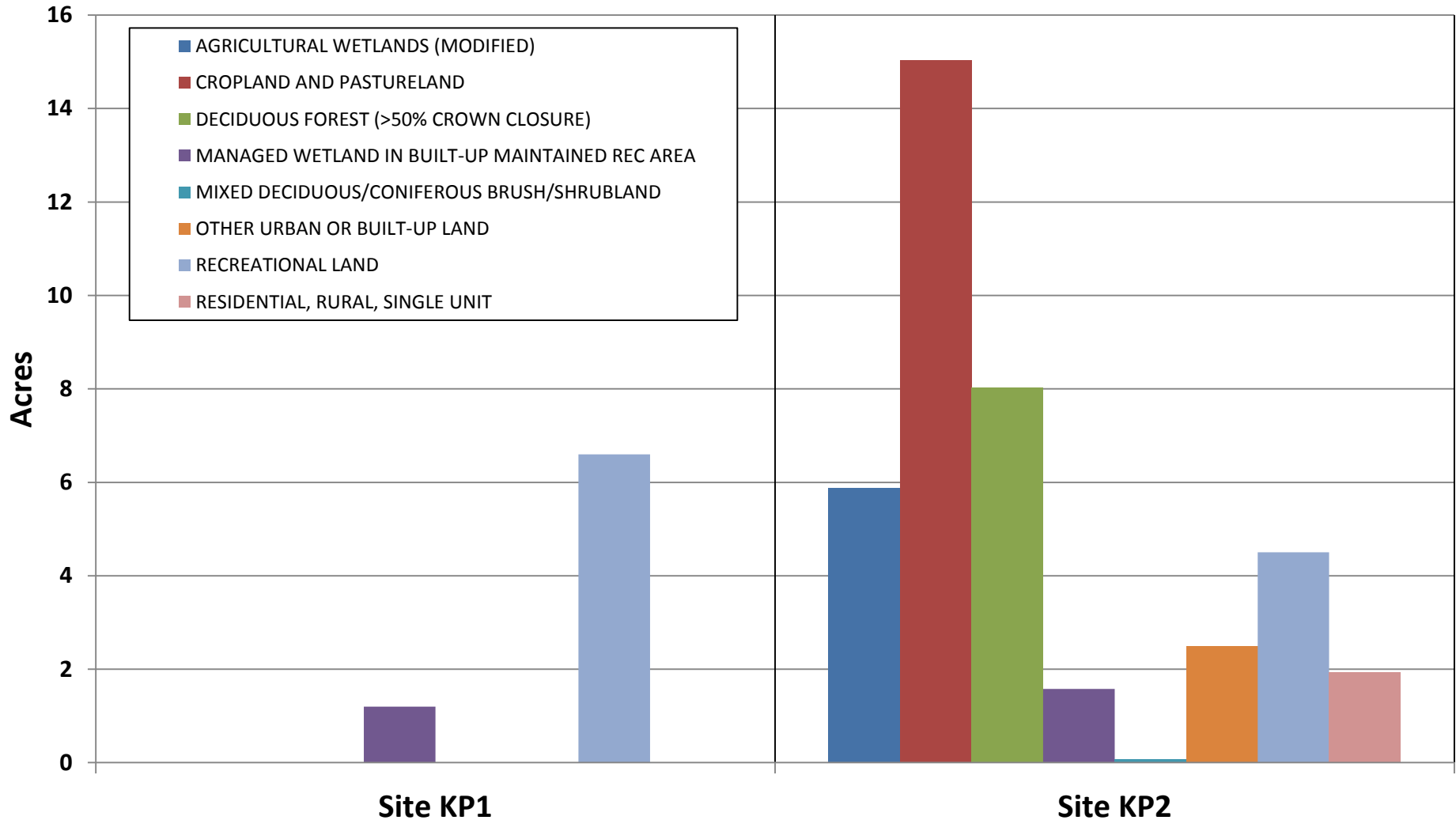
5 NRCS soil logs were collected and showed very limited infiltration at Kingwood Park due to shallow fragipan and plowpan (2" to 17" below surface)





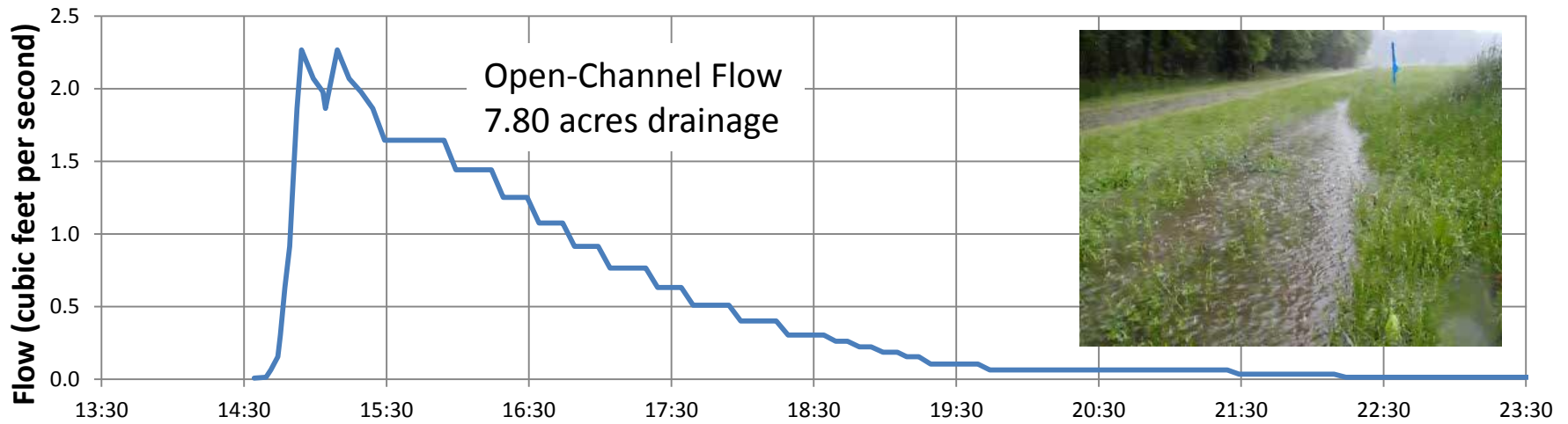
# Acres of Land Use

## Kingwood Park Sampling Sites KP-1 and KP-2

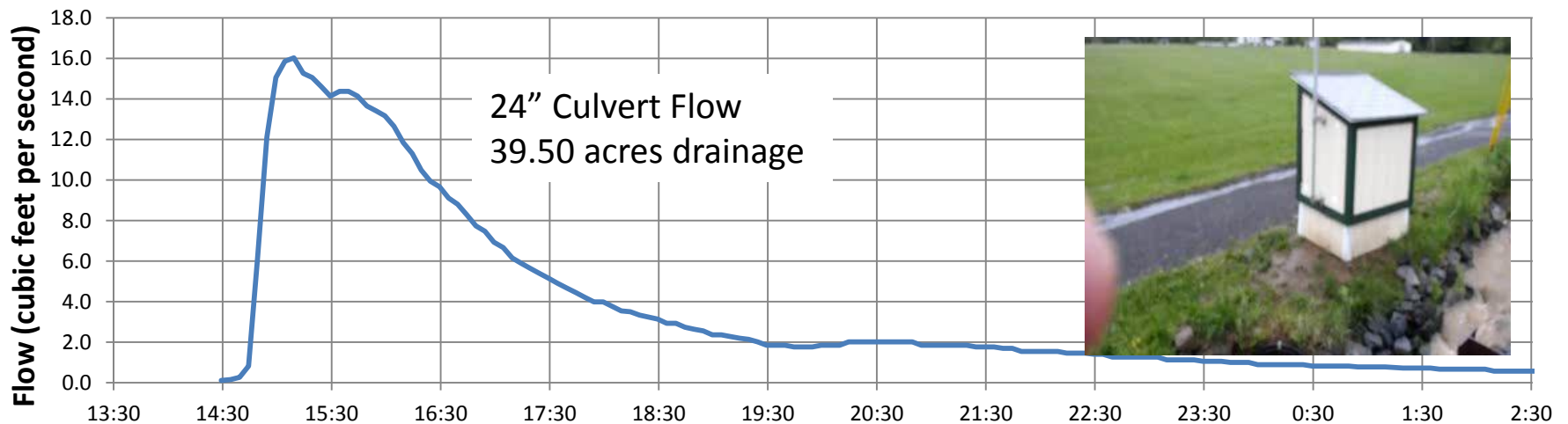


## 2 Sampling Sites in Kingwood Park – Same Storm Event

### KP-1 Stormwater Hydrograph - May 18, 2011



### KP-2 Stormwater Hydrograph - May 18 & 19, 2011

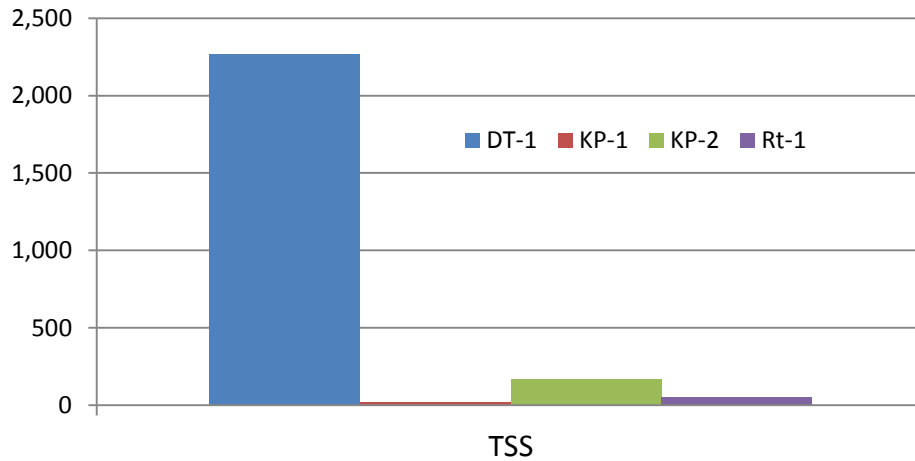




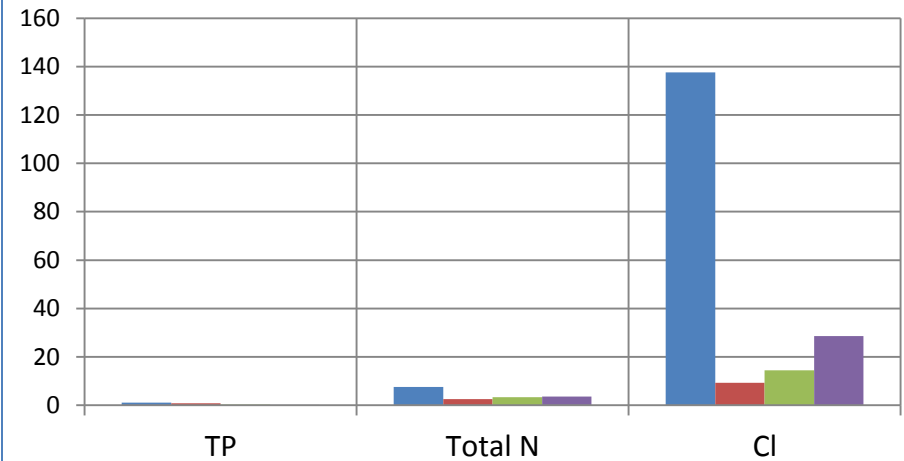
# Water Quality

## (April thru Sept)

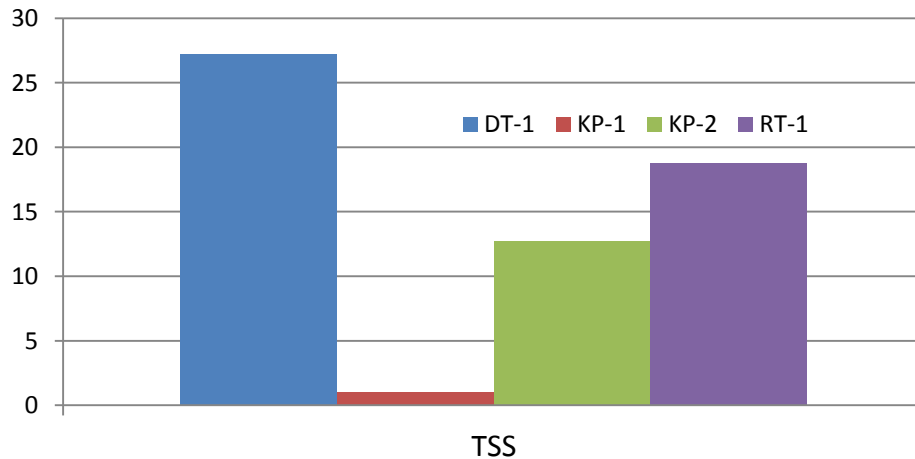
### Average Concentration (mg/l)



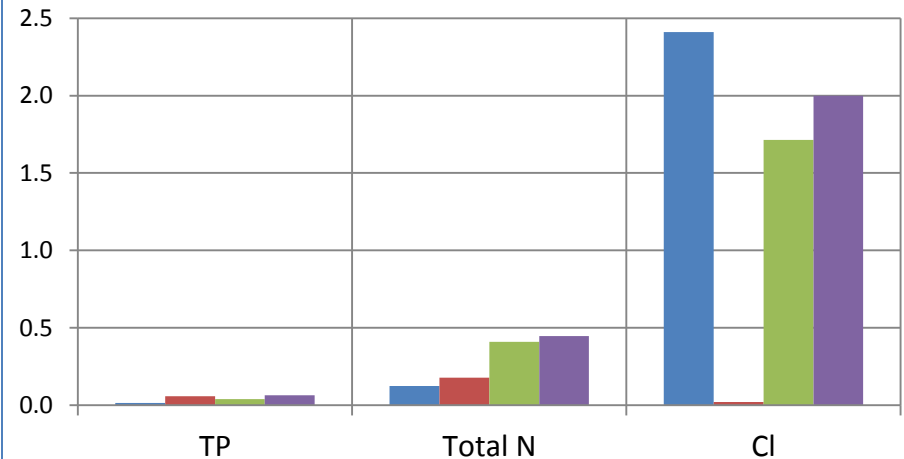
### Average Concentration (mg/l)



### Average Loading Per Acre (lb/acre)

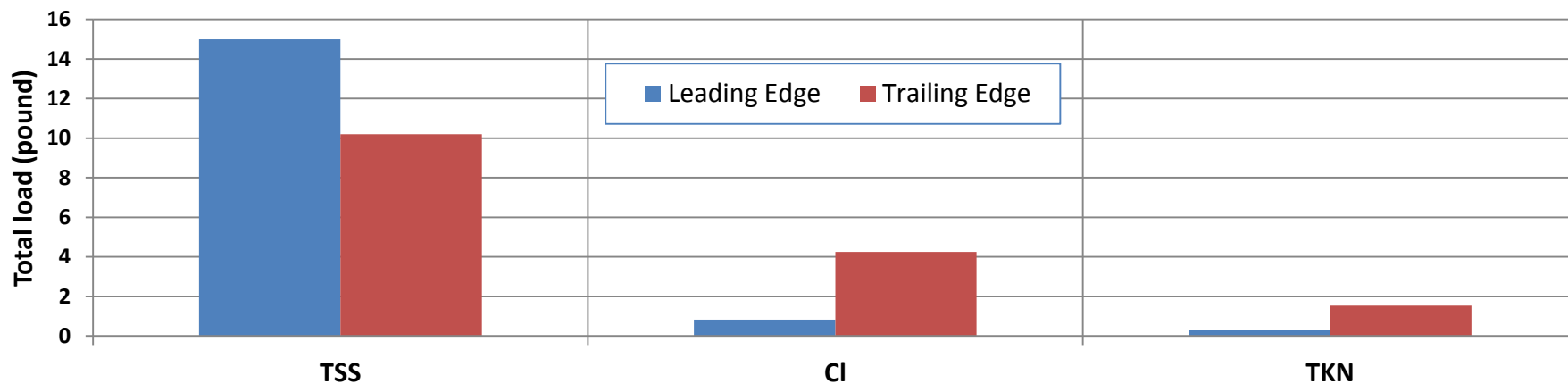


### Average Loading Per Acre (lb/acre)

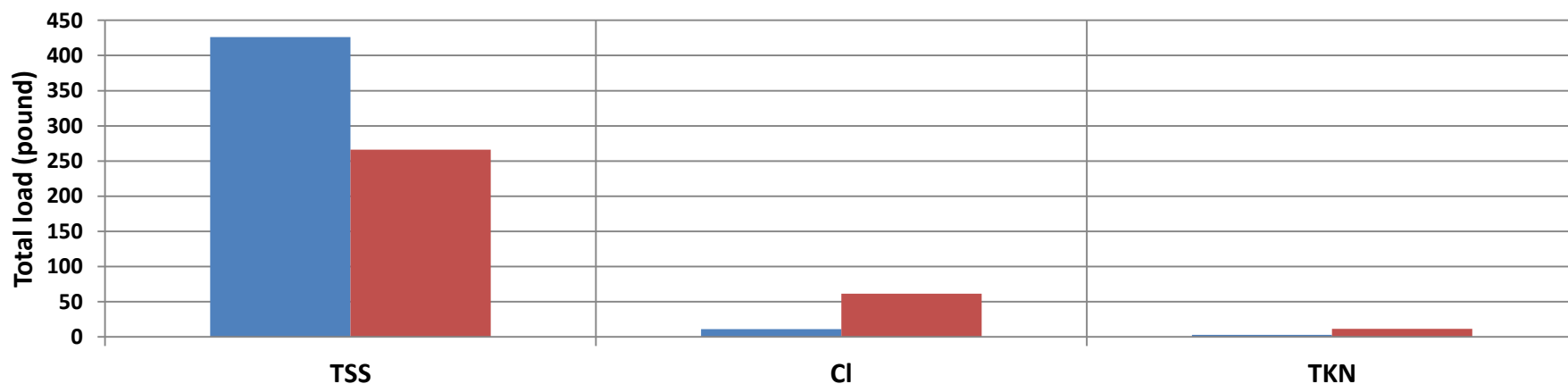


## Comparison of Water Quality Loadings from 2 Sampling Sites in Kingwood Park

**KP-1 Water Quality Loadings**  
**May 18, 2011**



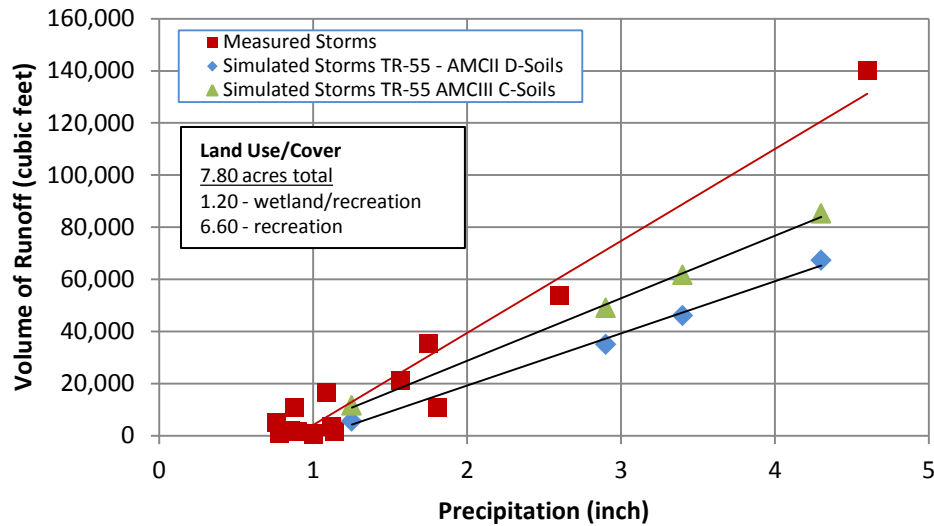
**KP-2 Water Quality Loadings**  
**May 18, 2011**



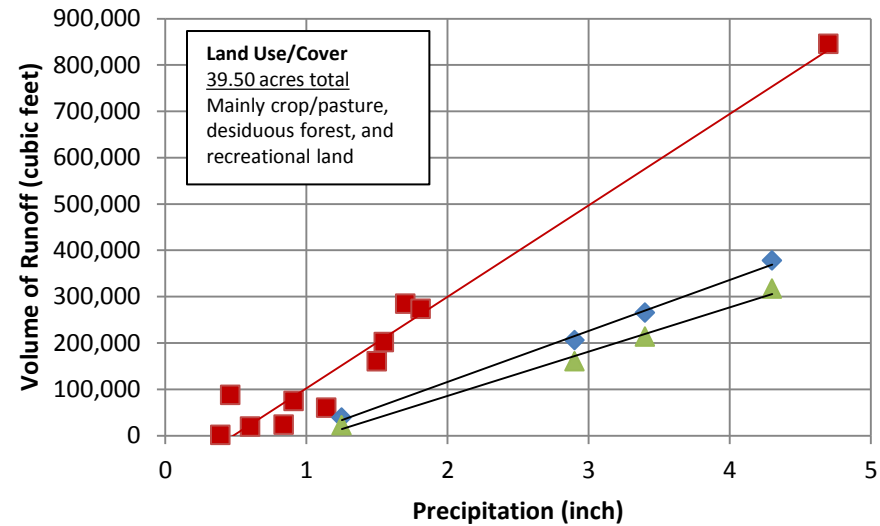


# Storm Runoff Volume

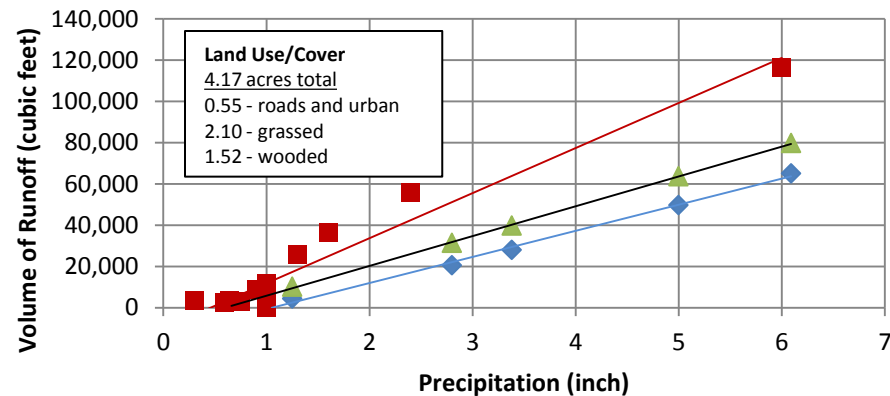
Runoff Volume Measured Versus Estimate  
KP-1 Kingwood Park Athletic Fields



Runoff Volume Measured Versus Estimates  
KP-2 Kingwood Park Mixed Land Use/Cover



Runoff Volume Measured Versus Estimates  
RT-1 Oak Grove Road



# Next Steps

- Implement stormwater controls at completed monitoring sites
- Initiate monitoring at final roadway-drainage sites
- Expand storm monitoring and stormwater controls to open-space areas



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## **Program information/reports:**

<http://www.raritanbasin.org/lockwick.html>